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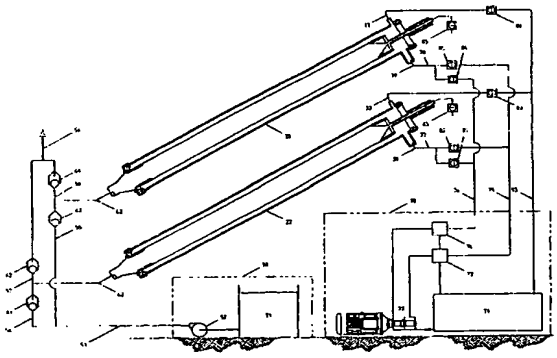
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FLUID OPERATED PUMP



(57) Abstract: A pumping system comprising a pump (21) for conveying a pumped fluid using an actuating fluid. The pump comprising a rigid outer casing (25) defining an interior space (26), a tube structure (27) accommodated in the interior space (26), the tube structure (27) being flexible and substantially inelastic. The interior of the tube structure (27) defines a pumping chamber (28) for receiving pumped fluid. The tube structure (27) is movable between laterally expanded and collapsed conditions for varying the volume of the pumping chamber (28) thereby to provide discharge and intake strokes. The region of the interior space (26) surrounding the tube structure (27) defines an actuating region for receiving and accommodating actuating fluid. The pumping chamber (28) is adapted to receive pumped fluid to cause the tube structure (27) to move towards the expanded condition and the pumping chamber (28) thereby undergoing an intake stroke. The pumping chamber (28) undergoes a discharge stroke upon collapsing of the tube structure (27) in response to the action of actuating fluid in the actuating region. The pumping system also comprises a delivery means (50) for delivering pumped fluid to the pumping chamber (28) in timed sequence for causing the pumping chamber (28) to undergo an intake stroke, and means (70) for supplying actuating fluid to the actuating region in timed sequence to cause the tube structure (27) to laterally collapse whereby the pumping chamber (28) undergoes a discharge stroke.

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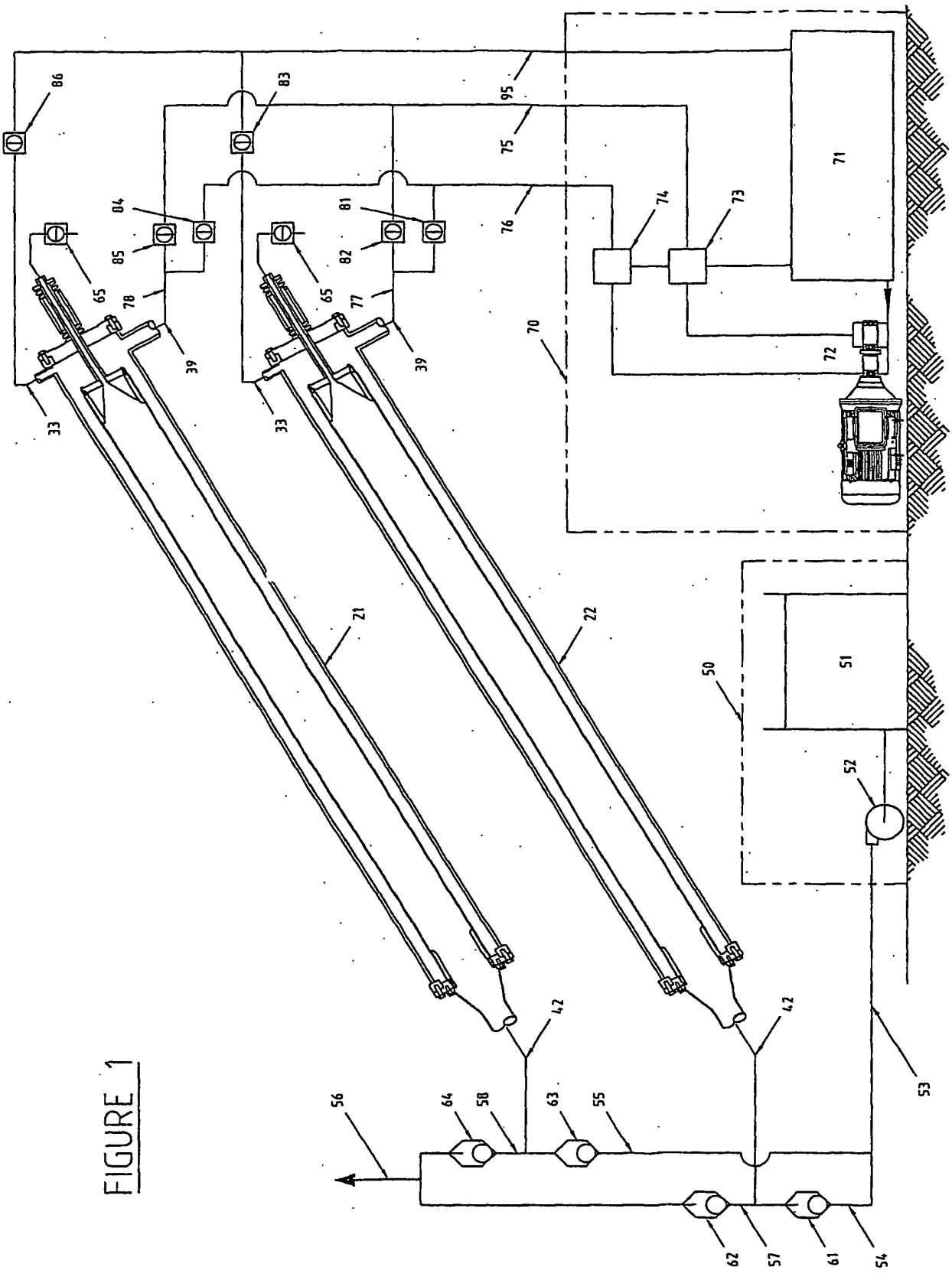
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FIGURE 1

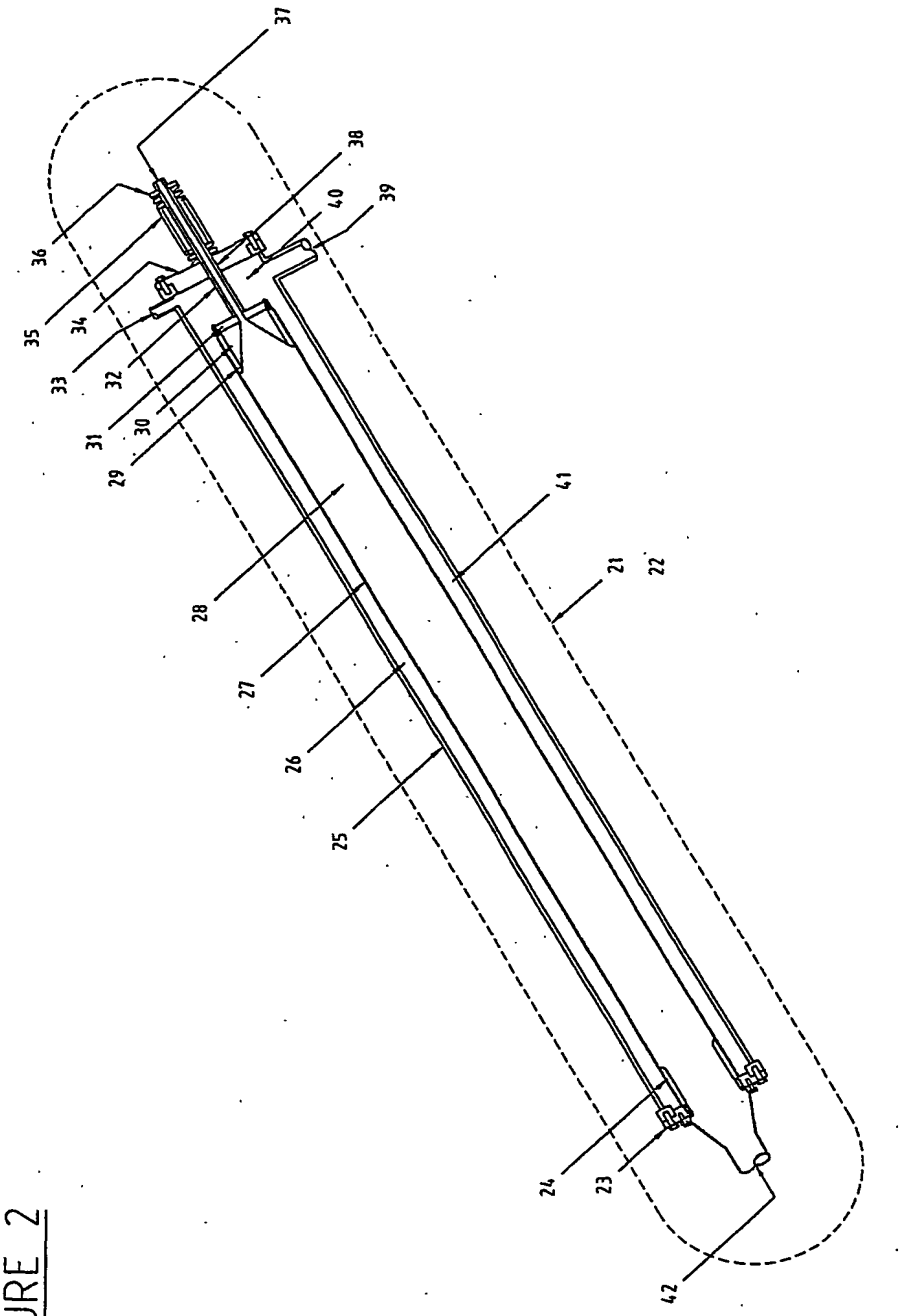

FIGURE 2

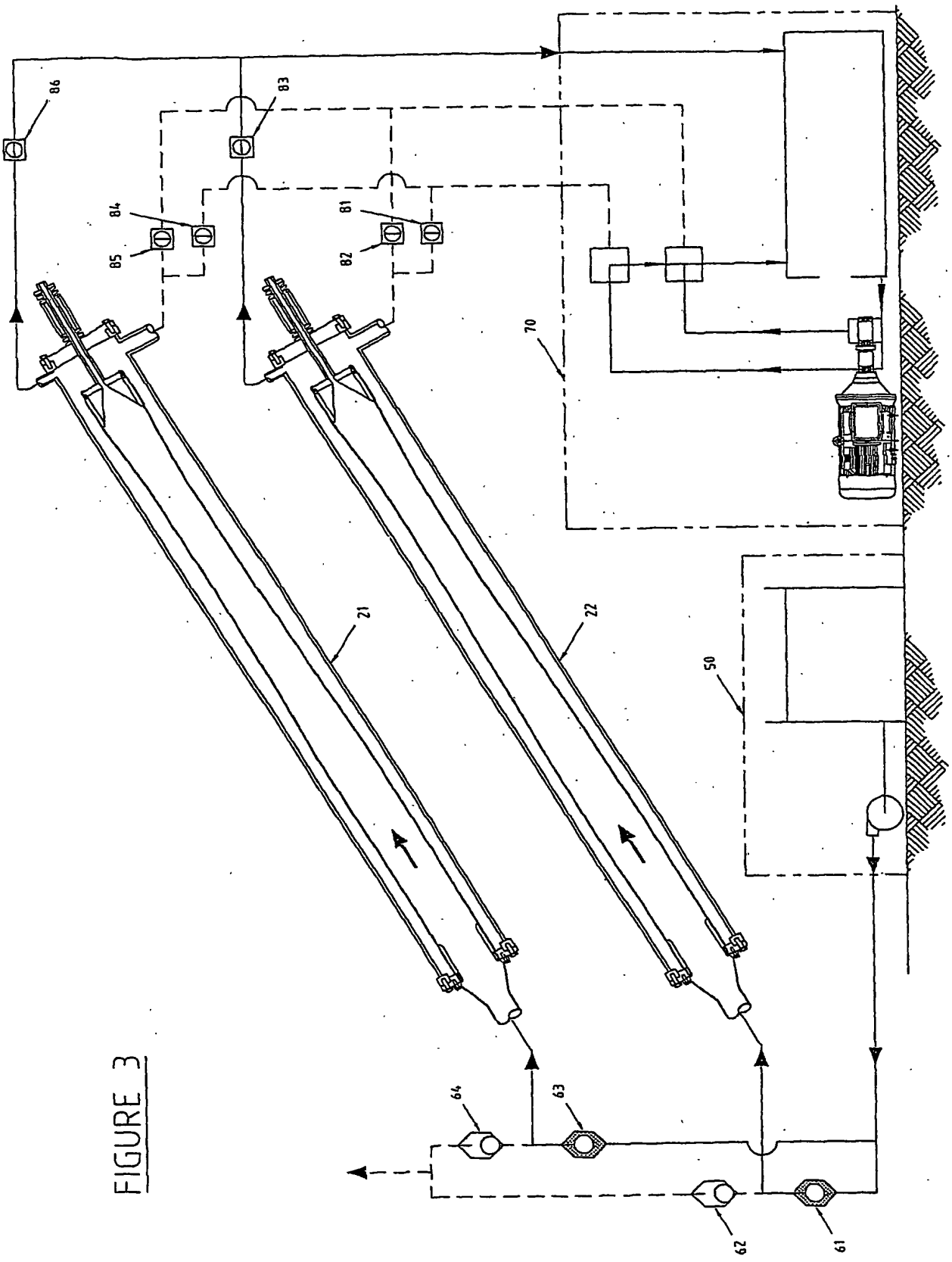

FIGURE 3

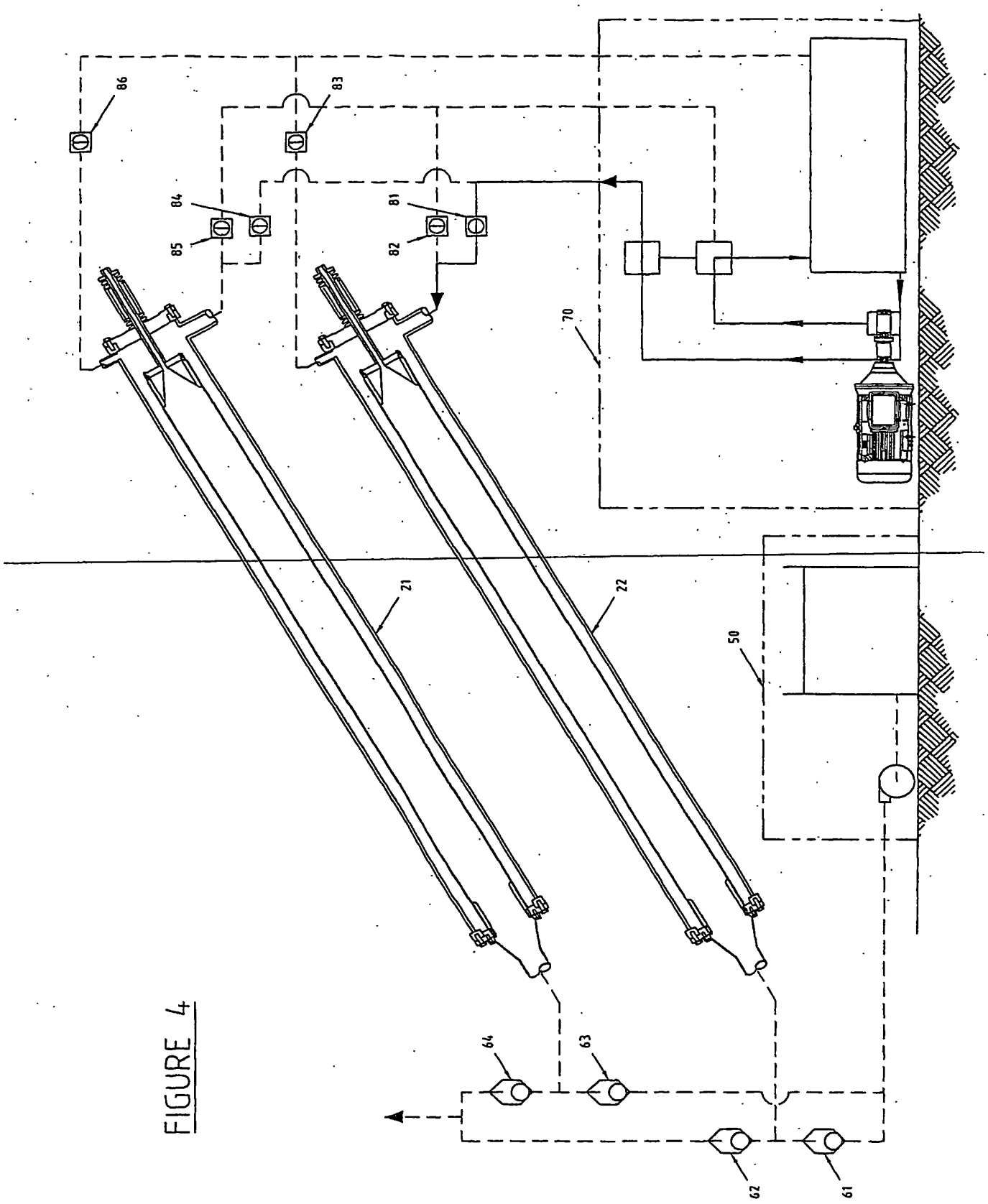

FIGURE 4

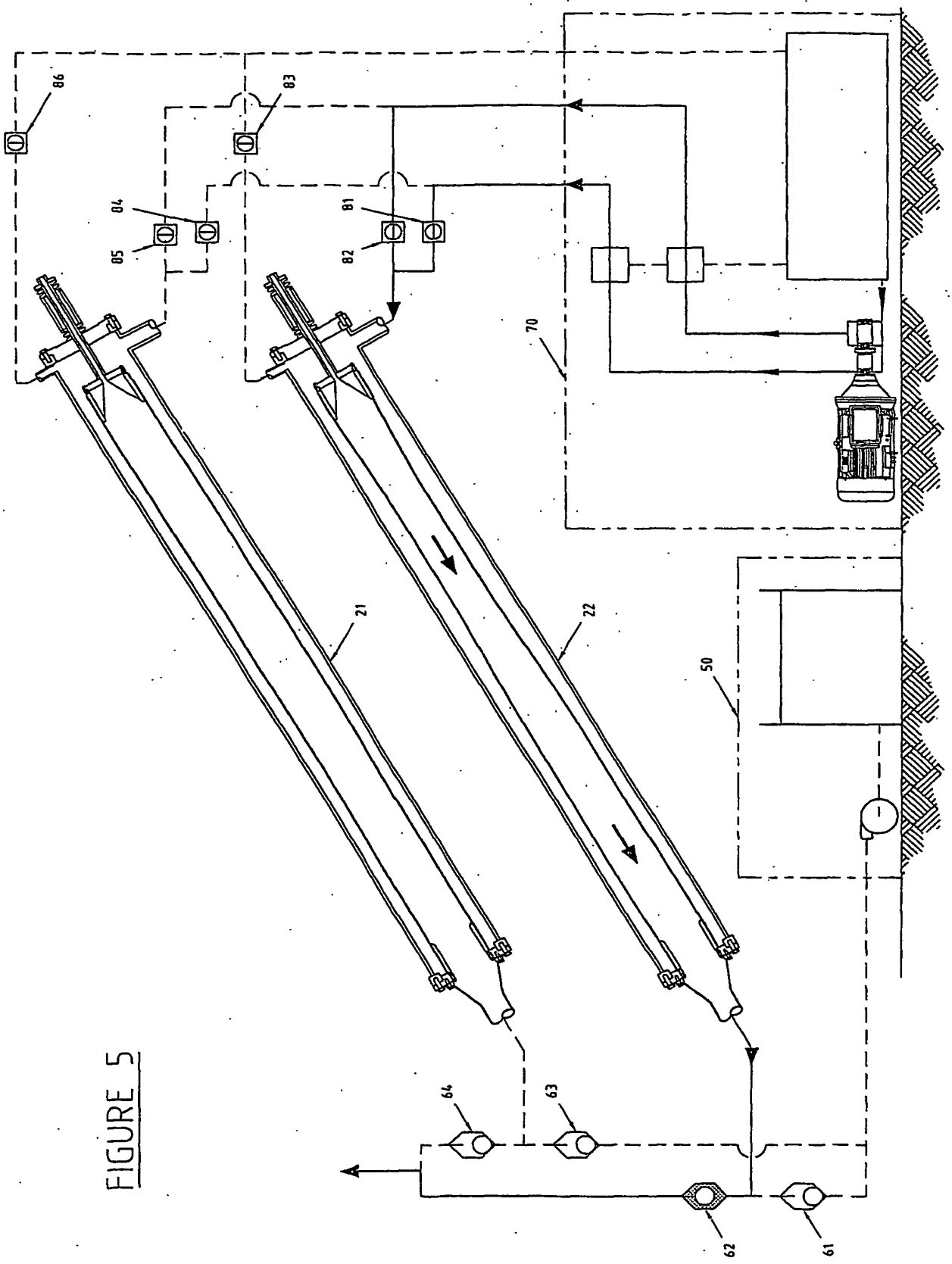

FIGURE 5

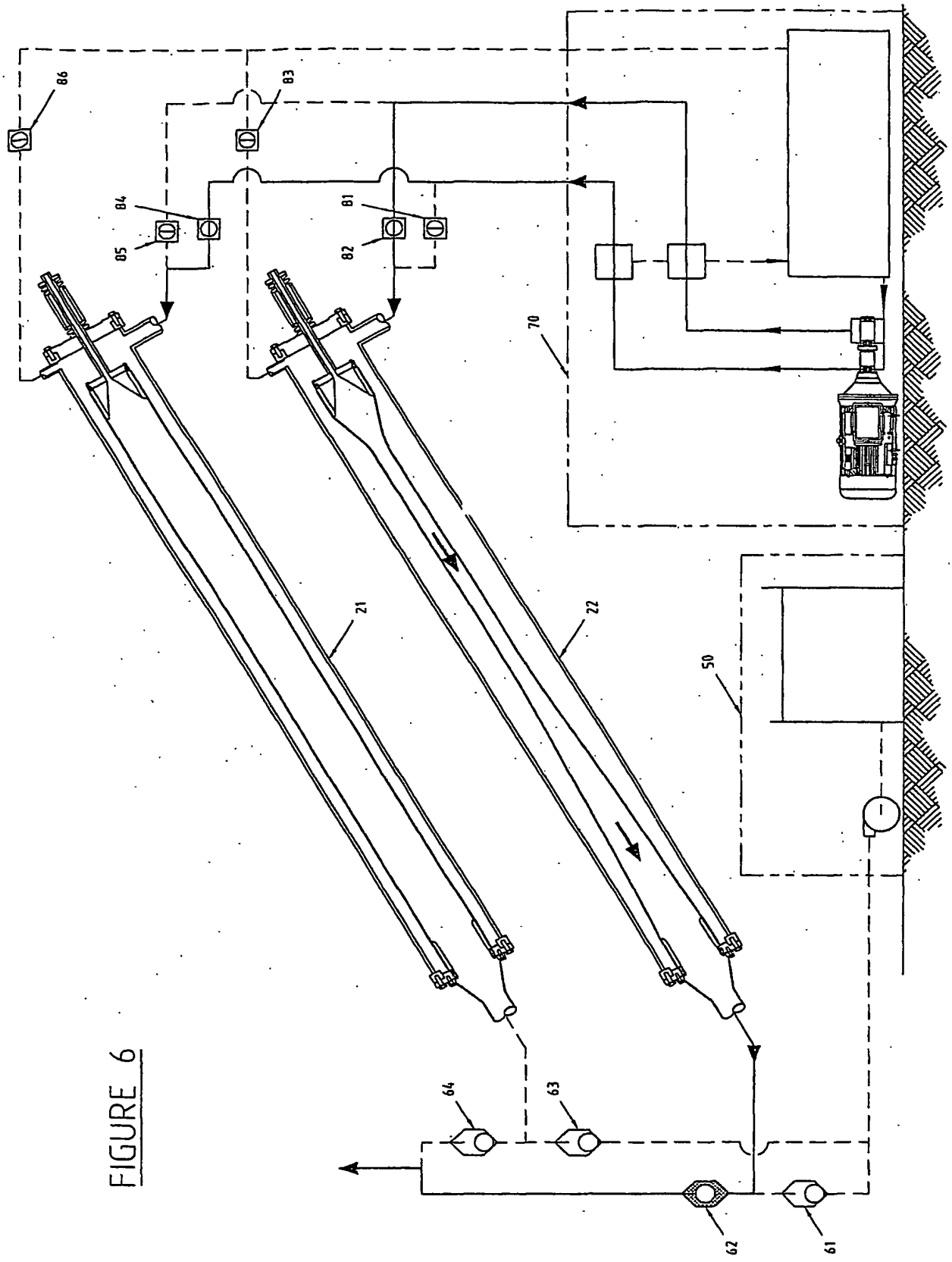

FIGURE 6

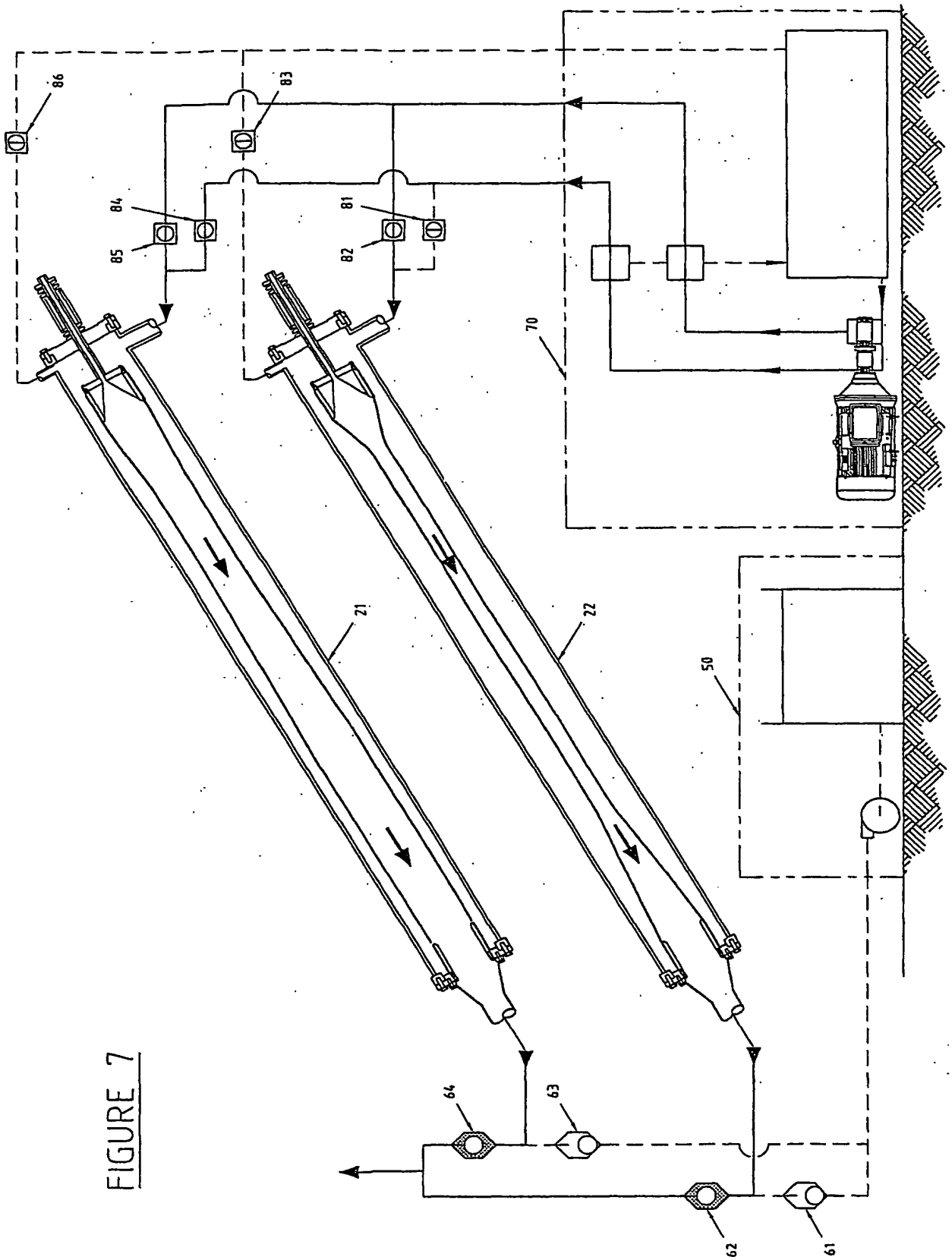

FIGURE 7

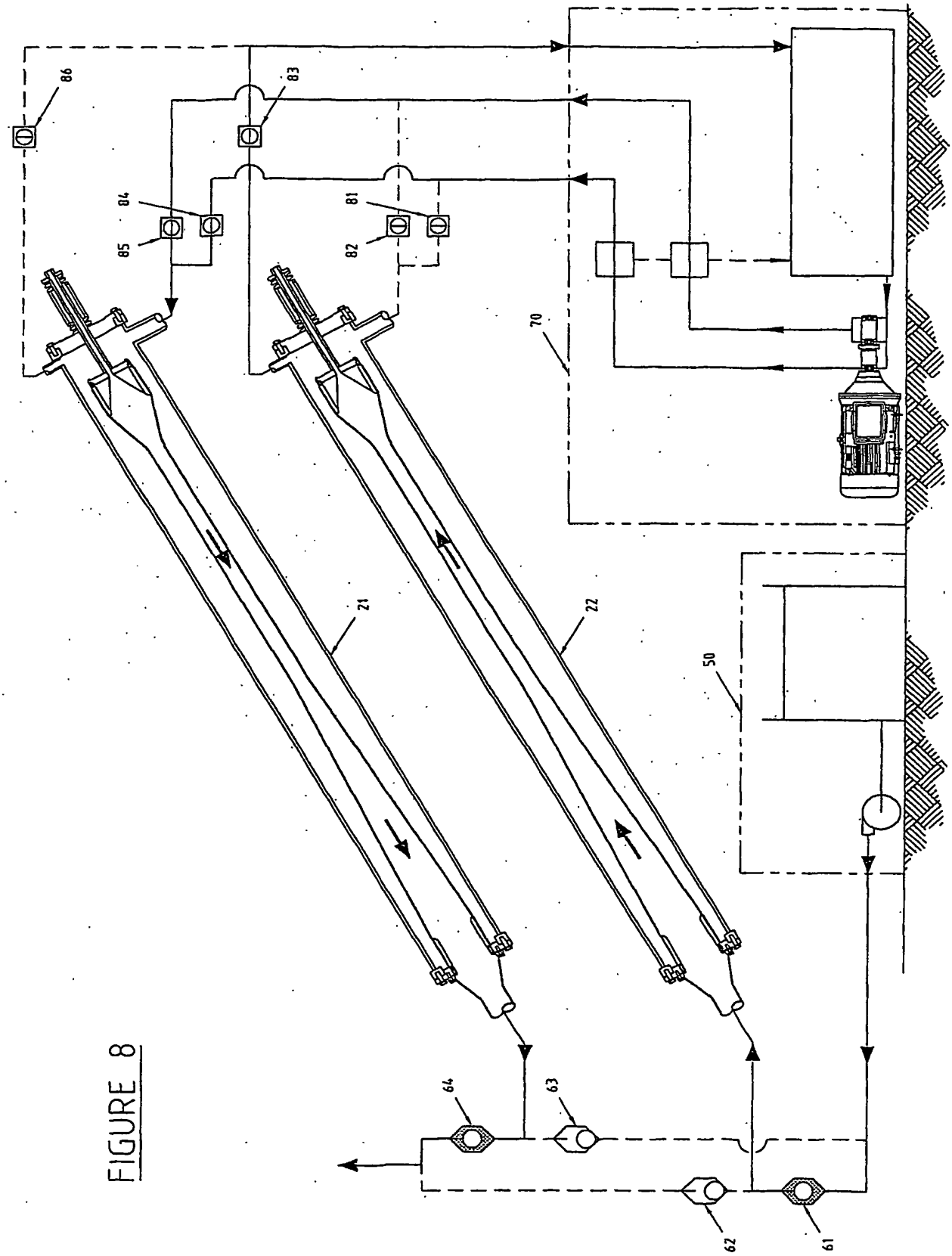

FIGURE 8

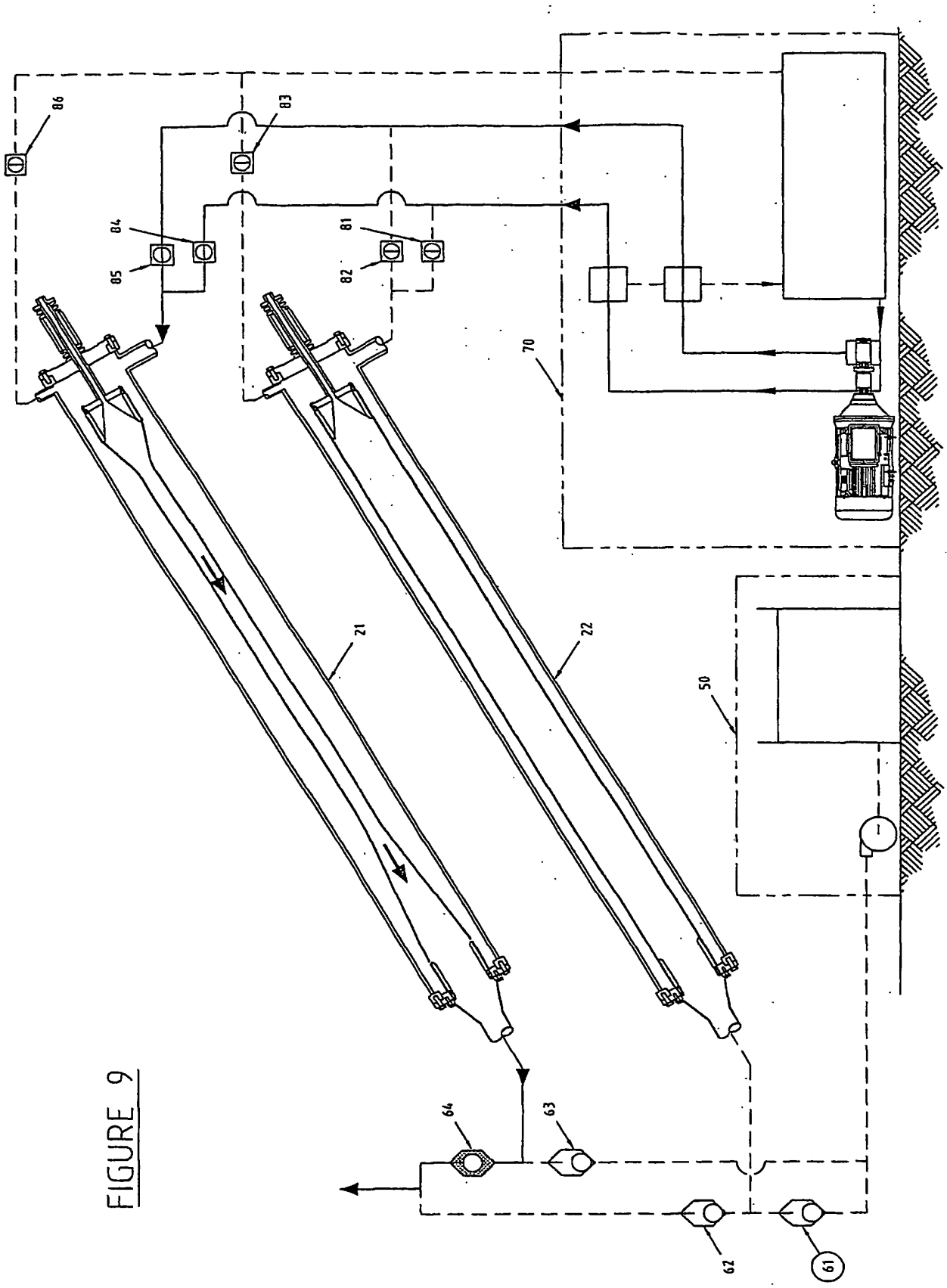

FIGURE 9

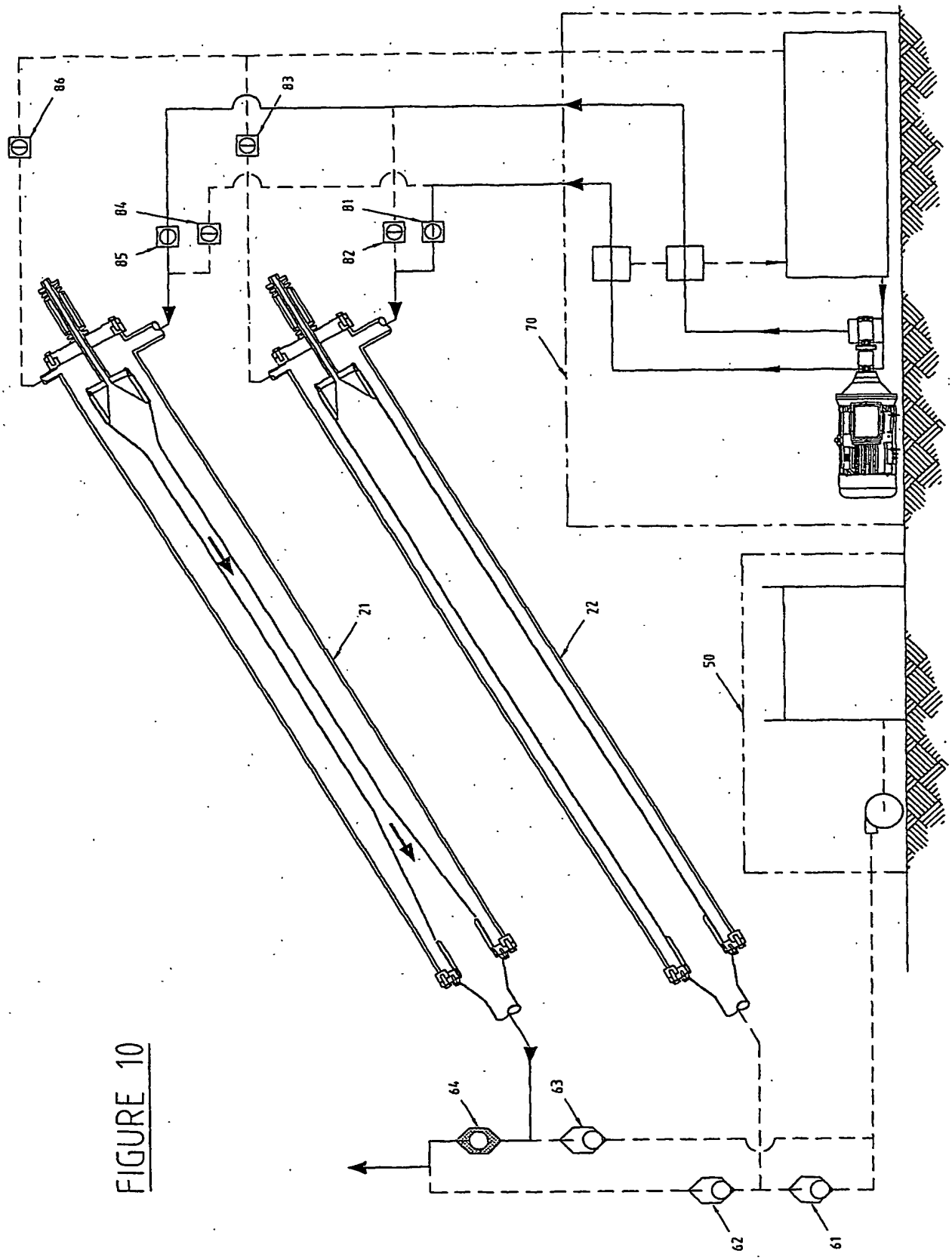

FIGURE 10

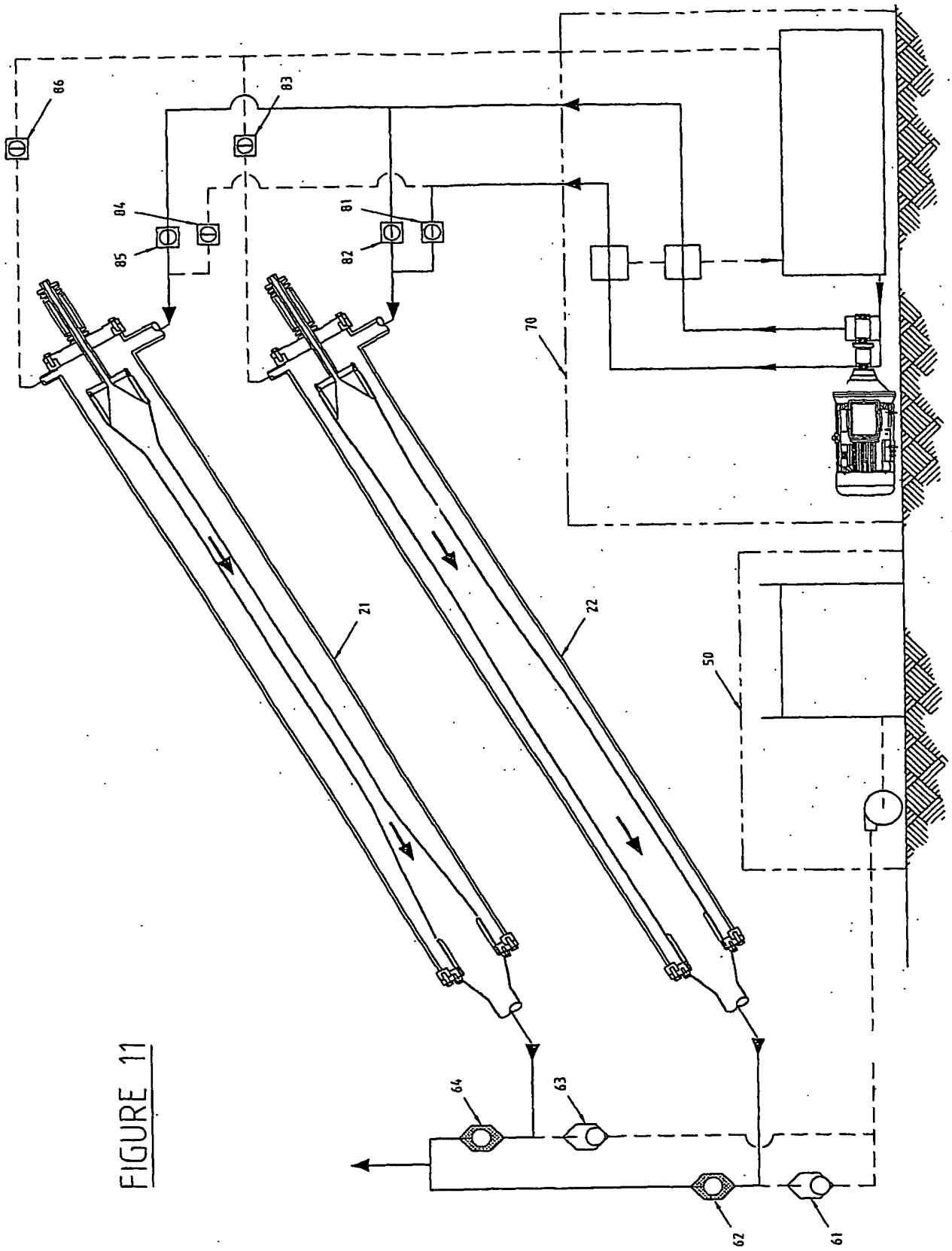

FIGURE 11

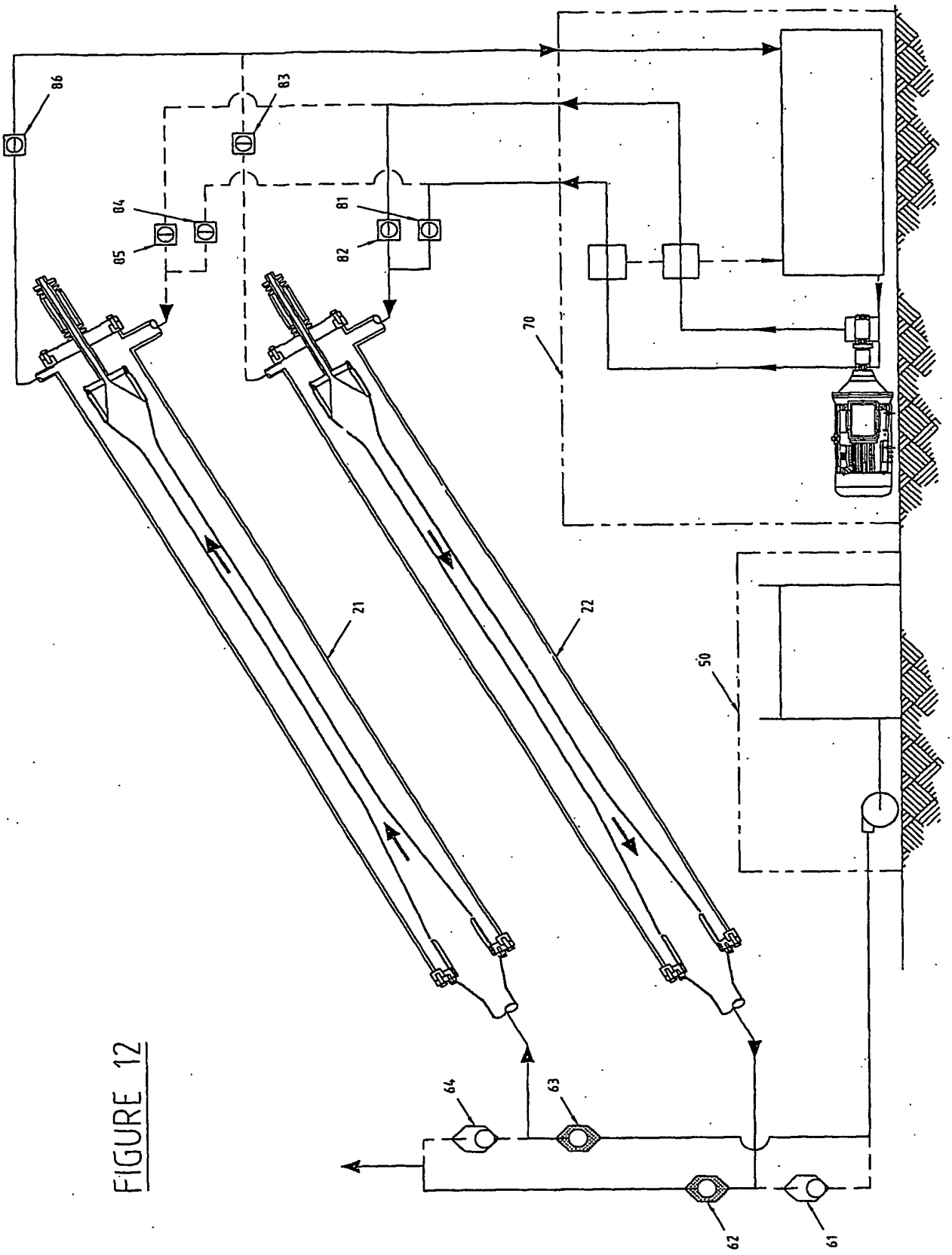

FIGURE 12

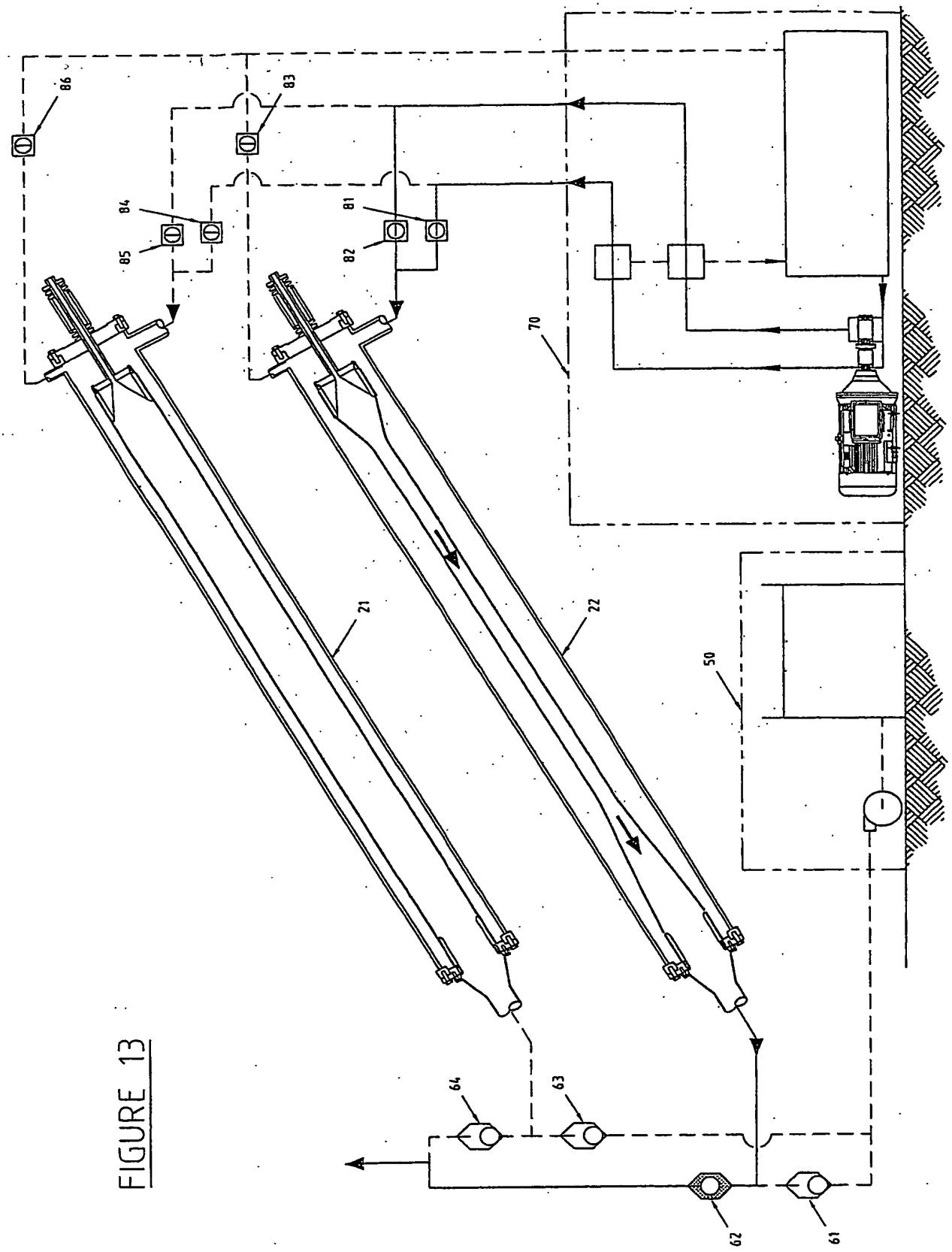

FIGURE 13

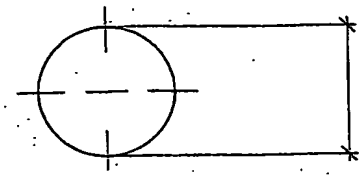

FIGURE 15

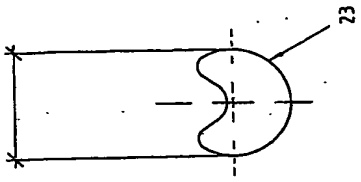

FIGURE 17

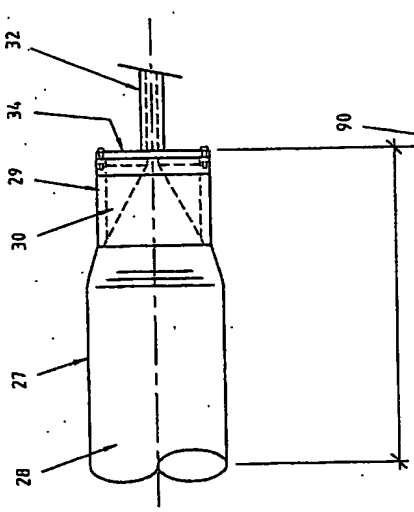

FIGURE 14

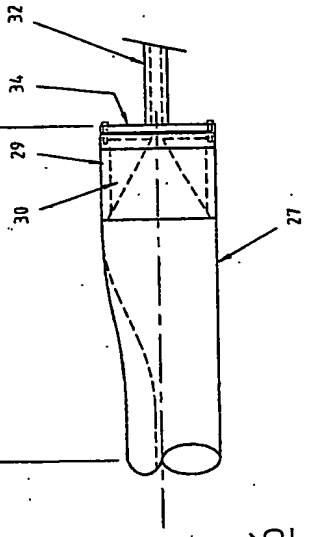

FIGURE 16

FIGURE 18

	CHAMBER 21				CHAMBER 22			
Reference	Valve 84	Valve 85	Valve 86	Description	Valve 84	Valve 85	Valve 86	Description
Figure 3	Closed	Closed	OPEN	Tube 27 fills, fluid in the Chambers 40, 41 returns to tank until the Tube is FULL	Closed	Closed	OPEN	Tube 27 fills, fluid in the Chambers 40, 41 returns to tank until the Tube is FULL
	Control system instrumentation must confirm the Tube 27 FULL status before proceeding to the next step							
Figure 4	Closed	Closed	Closed	Tube 27 remains FULL	OPEN	Closed	Closed	Chamber 40, 41 is pressurised to the system operating pressure
Figure 5	Closed	Closed	Closed	Tube 27 remains FULL	OPEN	OPEN	Closed	Pump stroke commences
Figure 6	OPEN	Closed	Closed	Chamber 40, 41 is pressurised to the system operating pressure	Closed	OPEN	Closed	Pump stroke continues
Figure 7	OPEN	OPEN	Closed	Pump stroke commences	Closed	OPEN	Closed	Pump stroke finishing
Figure 8	OPEN	OPEN	Closed	Pump stroke continues	Closed	Closed	OPEN	Tube 27 starts filling and fluid in Chambers 40, 41 returns to tank
Figure 9	OPEN	OPEN	Closed	Pump stroke continues	Closed	Closed	Closed	Tube 27 is FULL , control system instrumentation must confirm FULL Tube status before proceeding to the next step
Figure 10	Closed	OPEN	Closed	Pump stroke continues	OPEN	Closed	Closed	Chambers 40, 41 is pressurised to the system operating pressure
Figure 11	Closed	OPEN	Closed	Pump stroke finishing	OPEN	OPEN	Closed	Pump stroke commences
Figure 12	Closed	Closed	OPEN	Tube 27 starts filling and fluid in Chambers 40, 41 returns to tank	OPEN	OPEN	Closed	Pump stroke continues
Figure 13	Closed	Closed	Closed	Tube 27 is FULL , control system instrumentation must confirm FULL Tube status before proceeding to the next step	OPEN	OPEN	Closed	Pump stroke continues
	Sequence repeats from Figure 6							
Figure 6	OPEN	Closed	Closed	Chambers 40, 41 is pressurised to the system operating pressure	Closed	OPEN	Closed	Pump stroke continues
Figure 7	OPEN	OPEN	Closed	Pump stroke commences	Closed	OPEN	Closed	Pump stroke finishing
Figure 8	OPEN	OPEN	Closed	Pump stroke continues	Closed	Closed	OPEN	Tube 27 starts filling and fluid in Chambers 40, 41 returns to tank
Figure 9	OPEN	OPEN	Closed	Pump stroke continues	Closed	Closed	Closed	Tube 27 is FULL , control system instrumentation must confirm FULL Tube status before proceeding to the next step

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU03/00953

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: F04B 43/10, 43/113

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Refer electronic database consulted below

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI - F04B 43/08, 43/10, 43/107, 43/113, 15/02 and keywords expand, collapse and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2195149 A (S B SERVICES (PNEUMATICS) LTD) 30 March 1988 Whole document	1,4,10-16,48
X Y	WO 82/01738 A1 (RIHA) 27 May 1982 Page 12, line 37- page 14, line 15 & figures	1,4,10-16,48 2,5-9,17-24,27-32,35-36,49-50
Y	US 6345962 B1 (SUTTER) 12 February 2002 Whole document	2,8-9,35-36,40

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 August 2003	9 SEP 2003
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer R. SUBBARAYAN Telephone No : (02) 6283 2377

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU03/00953

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Derwent Abstract Accession No 99-324690/27, Q56, JP 11117872 A (IWAKI CO LTD) 27 April 1999	38-39,46,50
X Y	US 4543044 A (SIMMONS) 24 September 1985 Whole document	46-47,50 17-24,27-32,49-50
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A	US 5897530 A (JACKSON) 27 April 1999	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU03/00953

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Patent Document Cited in Search Report		Patent Family Member					
GB	2195149	NONE					
WO	8201738	AU	77737/81	EP	73196		
US	6345962	NONE					
US	4543044	AU	35155/84	CA	1224082	DE	3441054
		FR	2554515	IN	161834	JP	60116882
		ZA	8408740	ZW	203/84		
US	5114319	EP	422745	JP	3185276	NL	8902546
US	4257751	NONE					
US	4886432	NONE					
US	5897530	EP	944405	WO	9933503		

END OF ANNEX